Sperm DNA fragmentation testing: A Summary for Patients.

Sperm DNA is packaged by nature in a different way compared to that of other cells in the body. In sperm cells, DNA is arranged in very tight organised loops so that it can be carried safely to it is final destination – the egg.

The semen protects sperm from several hazards along is trek. Oxidative stress is related to the integrity of the packaging of the DNA of the sperm. Certain reactive oxygen species can "nick" the sperm DNA under certain circumstances and cause DNA fragmentation. Sperm DNA can be injured in this way.

If such a sperm is accepted into an egg for fertilisation, errors in DNA transcription and synthesis can occur when maternal and paternal DNA join. Several researchers have shown no correlation between high DNA fragmentation and fertilisation rate (Larson et al, 2000; Henkal et al, 2003; Zini et al 2005). This is worrisome because if the sperm has damaged DNA it may fertilise an egg and the resulting embryo may appear normal, but may arrest or implant and eventually miscarry.

Fortunately, there is a test that can assess this problem. The sperm chromatin structure assay (SCSA) can measure a DNA fragmentation index (DFI). This test may reveal high susceptibility toward DNA damage, or actual DNA fragmentation already present in sperm. If this index is elevated (generally above 30%), the fertility of that specimen is reduced (Everson, et al 2002).

The SCSA identifies DNA strands in sperm that are susceptible to fragmentation. Also detected is highly sustainable DNA, which shows altered packaging of sperm DNA. Again, this is important to know because sperm with fragmented DNA are more likely to cause a problem in the resulting embryos, compared to those with normally packaged DNA.

What can be done about highly fragmented sperm DNA? Can it is still be used? Investigations have found specimens with high DNA fragmentation can still be safely used in IVF / ICSI cycles, but outcomes are poor in IUI or "regular" non-ICSI-IVF. In fact, research colleagues have reported sperm with very high DNA fragmentation can result in healthy pregnancies (Virro et al, 2004; Meriano et al, 2005).

Although pregnancies are possible with specimens with high DNA damage, the rate of pregnancy does show a negative correlation with these specimens. Smoking causes DNA fragmentation & should be discontinued to improve outcome in any fertility programme. In some cases, three months of high antioxidant vitamins can lower the percent of the sperm affected by DNA damage.

Testing sperm for DNA damage can be useful in evaluating patients, because a standard of semen analysis will often fail to detect this problem (Sills et al, 2004). At SIMS Clinic, we recommend testing for sperm DNA fragmentation so this result can be carefully considered when developing treatment for our patients. If high DNA fragmentation is confirmed, IVF + ICSI should generally be the preferred strategy.

What can be done to treat DNA fragmentation in sperm?

Your doctor can diagnose and treat you for:

Leucocytospermia — Semen contains white blood cells. These cells can release so-called reactive oxygene species (ROS), leading to DNA fragmentation in the sperm nucleus.

Diabetes: — In the early phases of diabetes, high insulin levels can cause DNA to fragment.

Varicocele: — Varicose veins from the testicles decrease blood flow and disturb temperature control inside the scrotum.

What can you do yourself?

Temperature: — Normal temperature in scrotum is 33.3 °C (914 F). Temperature can be raised by a number of factors. Just sitting down for more than 6 hours a day, or wearing clothing that's tight around the crotch, are enough to raise the scrotal temperature. Do not put a laptop computer on your lap, or turn up the heating in your car seat. Hot baths should be avoided or limited in time. Fever, for instance with influenza or other diseases, can fragment DNA in the sperm.

Smoking: — Smoking causes ROS, resulting in DNA fragmentation.

Overweight: — Overweight decreases semen production and increases DNA fragmentation. You should consider loosing weight if your body mass index (BMI) is above 25.

Medication: — New studies confirm that a number of drugs cause DNA fragmentation . Remember to mention to your doctor, if you get any medication.

Factors difficult to change:

Age: — DNA fragmentation is increasing with age. Having children an earlier marriage is no guarantee that you don't have a problem with DNA fragmentation now.

Environment: — Air pollution, pesticides and a number of other chemicals can cause the DNA to fragment. It is important, therefore, to take safety measures when you're working with pesticides or other chemicals. Fruit and vegetables should be washed carefully before they're eaten.

Can DNA fragmentation be reduced after treatment?

If you are being treated by the doctor or do something yourself to reduce DNA fragmentation, it may take more than 3 months before a reduction can be measured. This is because it takes about 3 months to produce the sperm cells. But there is a genuine benefit: reducing DNA fragmentation will increase your partner's chances of a successful pregnancy.